

REMARKS

In the final Office Action dated December 19, 2008, the Examiner rejected claims 1-6 under 35 U.S.C. § 103(a) over U.S. Patent No. 5,561,742 to Terada et al ("Terada") in view of U.S. Patent No. 4,683,772 to Colimitra et al ("Colimitra") and U.S. Patent No. 6,459,956 to Matsumoto et al ("Matsumoto"). Applicant filed a response to the final Office Action on April 2, 2009. The Office mailed an Advisory Action on April 20, 2009, states that Applicant's arguments failed to place the application in condition for allowance. Applicant respectfully disagrees.

Claims 1-6

Applicant respectfully traverses the rejections of claims 1-6 under 35 U.S.C. § 103(a). No *prima facie* case of obviousness has been established because the Office Action has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the claimed invention and the prior art. Accordingly, the Office Action has failed to clearly articulate a reason why the prior art would have rendered the claimed invention obvious to one of ordinary skill in the art. See MPEP § 2141.

Claim 1 recites, among other things, a combination of "defining in a memory a virtual safety barrier including a trajectory of a work or tool ... surrounding the work or tool"; "defining at least two three-dimensional spatial regions including parts of the arm of the robot ..."; and "carrying out a control to start the braking of the arm at a predetermined distance ahead of the virtual safety barrier...." The cited references,

whether taken alone or in combination, fail to disclose or suggest at least these elements.

In particular, the Office Action equates the "spatial region" between Pa1 and Pa2 around robot A in *Terada* to the claimed "virtual safety barrier." See Final Office Action dated December 19, 2008, p. 5. *Terada*'s "spatial region, however, neither corresponds to nor suggest the claimed "virtual safety barrier." *Terada* states:

each robot stands vertically depending on an orientation for unit operation, and occupies a spatial region defined by one or two planes shifting in the Y-axis direction in accordance with the operation of the robot (*Terada*, col. 3, ll. 42-45); and

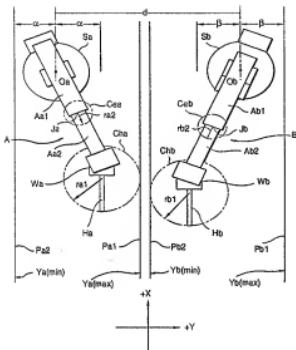
The robot A occupies a region which is equivalent to a spatial region defined by X-Z planes Pa1 and Pa2. Similarly, the robot B occupies a region which is equivalent to a spatial region defined by X-Z planes Pb1 and Pb2. In such a manner, each of the planes (Pa1, Pa2, Pb1, Pb2) is defined by an X-Z plane, so that these planes are parallel to each other. (*Id.*, col. 3, ll. 48-52).

According to *Terada*, robot A occupies a region defined by planes Pa1 and Pa2 (Pa1-Pa2) and robot B occupies a region defined by planes Pb1 and Pb2 (Pb1-Pb2). *Terada* further discloses that:

The operation of a robot is controlled unless the spatial region determined thus and a spatial region determined for another (adjacent) robot cross each other. (*Id.*, col. 3, ll. 64-66) (emphasis added).

Accordingly, in *Terada*, the robot is controlled when the region (Pa1-Pa2) of robot A crosses with the region (Pb1-Pb2) of robot B, so that "no interference occurs between robots." *Id.* col. 3, l. 64-col. 4, l. 4; see also FIG. 1 reproduced below.

FIG. 1



In other words, *Terada* discloses that a robot is controlled when the region occupied by the robot crosses the region occupied by another robot. In contrast, claim 1 of the present application recites "carrying out a control to start the braking of the arm ... and stop the movement of the arm ... if it is determined that any one of the three-dimensional spatial regions in at least one predicted position thereof based on the trajectory calculations will come into contact with a boundary of the virtual safety barrier. As recited, e.g., in claim 1, the virtual safety barriers surrounds a work or tool mounted on a wrist of a robot, and has surrounding boundaries spaced inward from a surrounding physical safety barrier. The claimed "said virtual safety barrier" belongs to the claimed robot; it does not belong to another robot. Therefore, *Terada* fails to disclose or suggest the claimed invention.

Colimitra does not disclose or suggest a "virtual safety barrier" or "carrying out a control to start the braking of the arm at a predetermined distance ahead of a

surrounding boundary of the virtual safety barrier" as recited in claim 1, and thus fails to cure the deficiency of *Terada*, discussed above.

Matsumoto, which was cited as allegedly teaching the "physical safety barrier," does not disclose or suggest a "virtual safety barrier" or "carrying out a control to start the braking of the arm at a predetermined distance ahead of a surrounding boundary of the virtual safety barrier" as recited in claim 1, and thus fails to cure the deficiencies of *Terada* and of *Colimitra*, discussed above.

As explained above, the elements recited in claim 1 are neither taught nor suggested by the cited references. Nor has the Examiner explained how teachings of the references could be properly modified to achieve the claimed combination. The Office Action has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the claimed invention. Accordingly, the Office Action has not clearly anticipate(?) a reason why the claim would have been obvious to one of ordinary skill in the art in view of the prior art. Therefore, no *prima facie* case of obviousness has been established for claim 1. Claim 1 is allowable over *Terada* in view of *Colimitra* and *Matsumoto*. Claim 2 depends from claim 1 and requires all of the elements of claim 1, and is patentable over the cited references at least for the same reasons as claim 1.

Independent claim 3, although of slightly different scope, recites elements similar to those recited in claim 1, and is allowable over the cited references for at least the same reasons as claim 1. Claims 4-6 depend from claim 3 and incorporate all of the elements of claim 3. Claims 4-6 are patentable at least for the same reasons as claim 3.

New Claims 8 and 9

Claim 8 recites a set of elements similar to claim 1. In addition, claim 8 also recites that "the virtual safety barrier is defined to be immovable with the robot under a working environment." Support for the newly added element can be found, e.g., at page 5, of the specification. The Office Action equates the "spatial region" between Pa1 and Pa2 around robot A in *Terada* to the "virtual safety barrier" as recited in the claims.

Terada discloses:

each robot stands vertically depending on an orientation for unit operation, and occupies a spatial region defined by one or two planes shifting in the Y-axis direction in accordance with the operation of the robot. (*Terada*, col. 3, ll. 42-45) (emphasis added).

when the position of the sphere Cea changes as the elbow joint Ja is changed according to the operation command, the X-Z plane Pa1 defining the spatial region moves in parallel and in the Y-axis direction, thus the spatial region being shifted. (*Id.*, col. 4, ll. 53-57) (emphasis added).

Since the region Pa1-Pa2 is the region that robot A occupies, in operation, the region Pa1-Pa2 will shift with the robot or the robot arm. *Terada* fails to disclose or suggest that "the virtual safety barrier is defined to be immovable with the robot under a working environment." Therefore, claim 8 is further distinguishable from *Terada*. Neither Colimitra nor Matsumoto discloses or suggests "the virtual safety barrier [being] immovable with the robot under a working environment." Therefore, new claim 8 is patentable over the cited references.

Claim 9 depends from claim 8 and requires all of the elements of claim 8. Accordingly, claim 9 is allowable at least for the same reasons as claim 8.

Conclusion

In view of the foregoing remarks, Applicant respectfully requests reconsideration of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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